



Leibniz-Institute of  
Freshwater Ecology  
and Inland Fisheries



# Light down!

## Solutions for sustainable outdoor lighting



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**Why light down not up?**

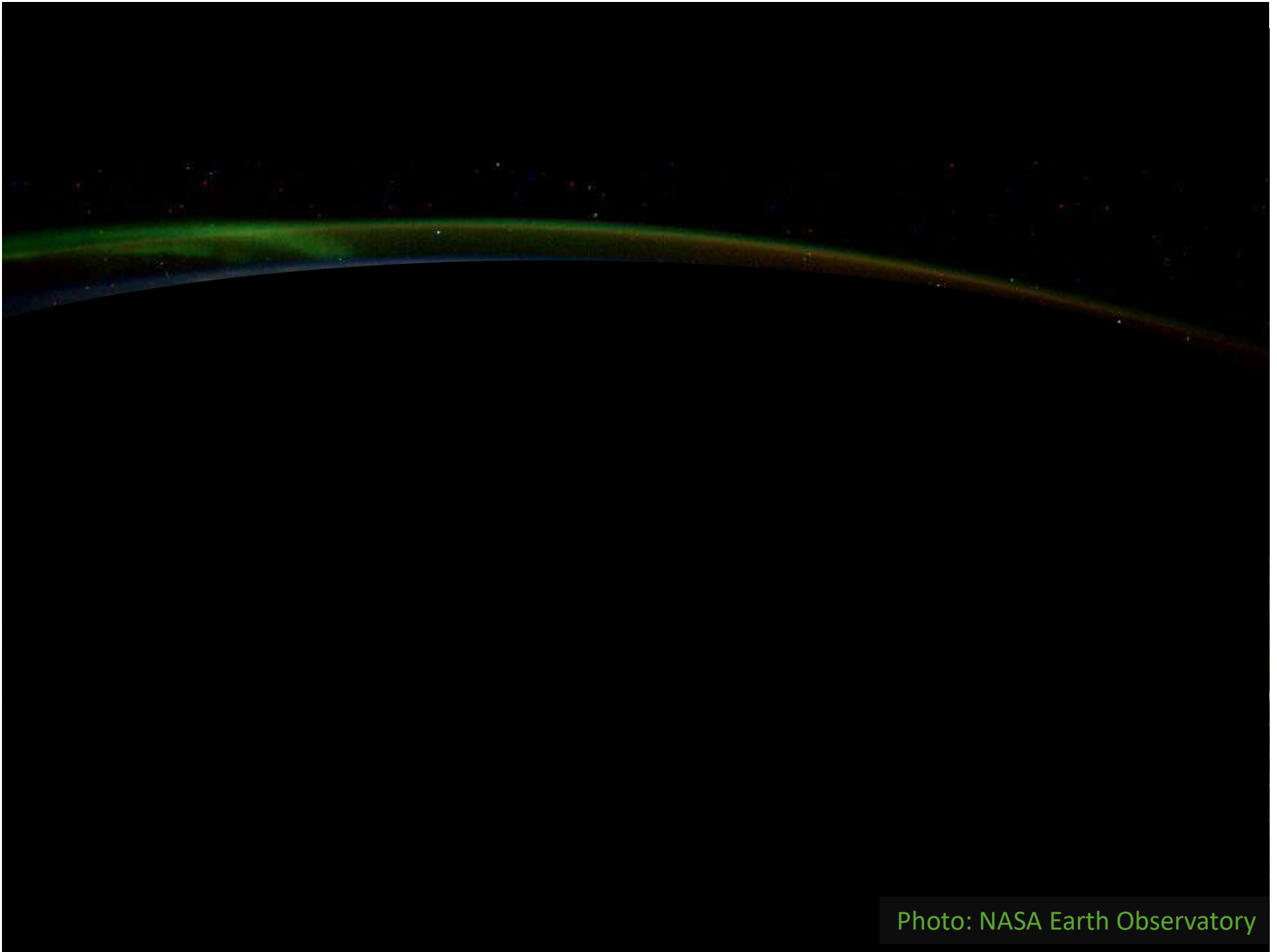


Photo: NASA Earth Observatory



Foto: E Photo: NASA Earth Observatory

9  
Inner City sky

7  
Suburban/urban  
transition

5  
Suburban sky

3  
Rural sky

1  
Excellent dark  
sky site

Altair

Rasalhague

IC 33

IC 4665  
Cebalrai

Sabik

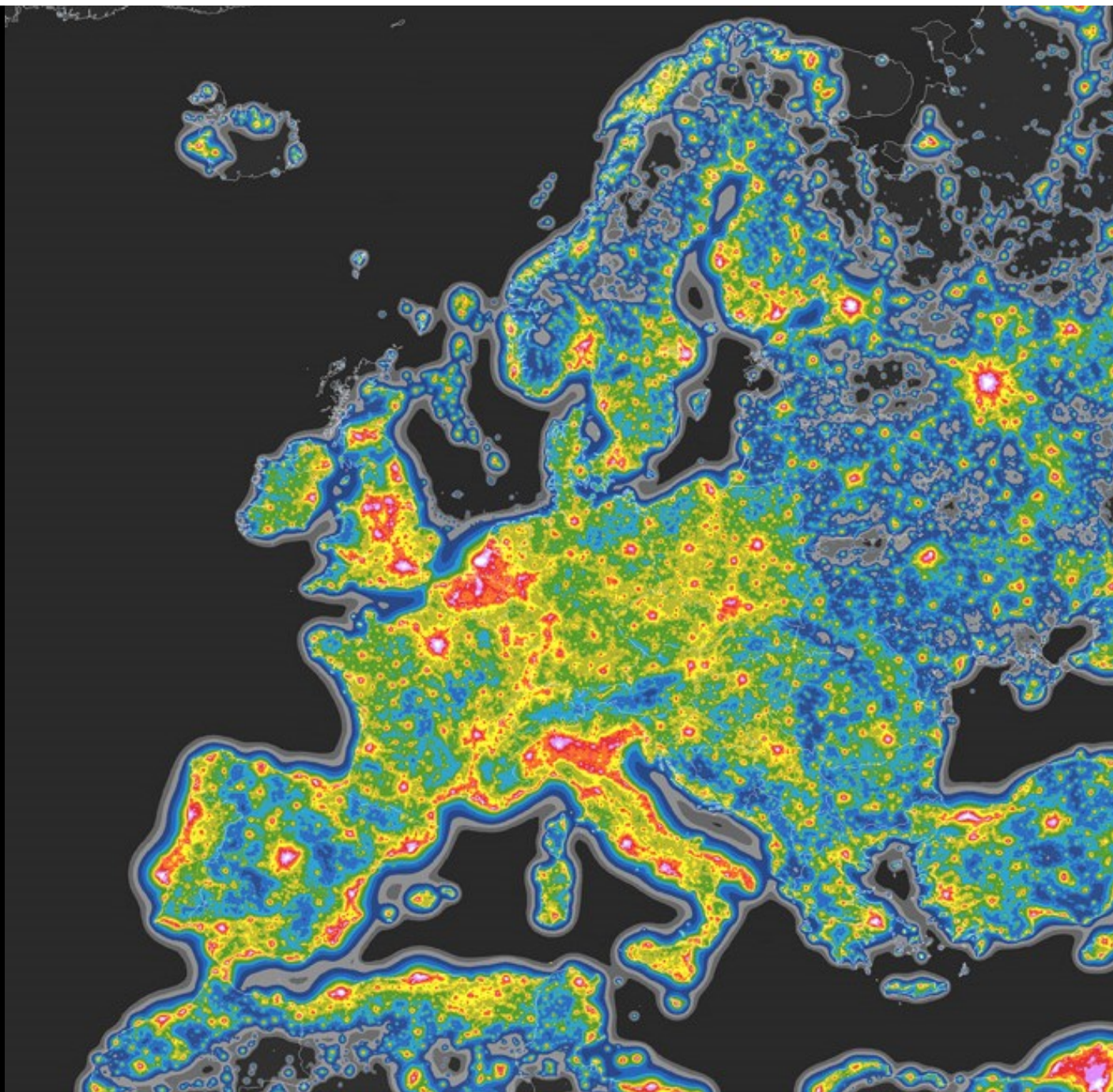
Jupiter

Nunki

NGC 6530

Edia





**So what?**  
**The landscapes get brighter who cares?**

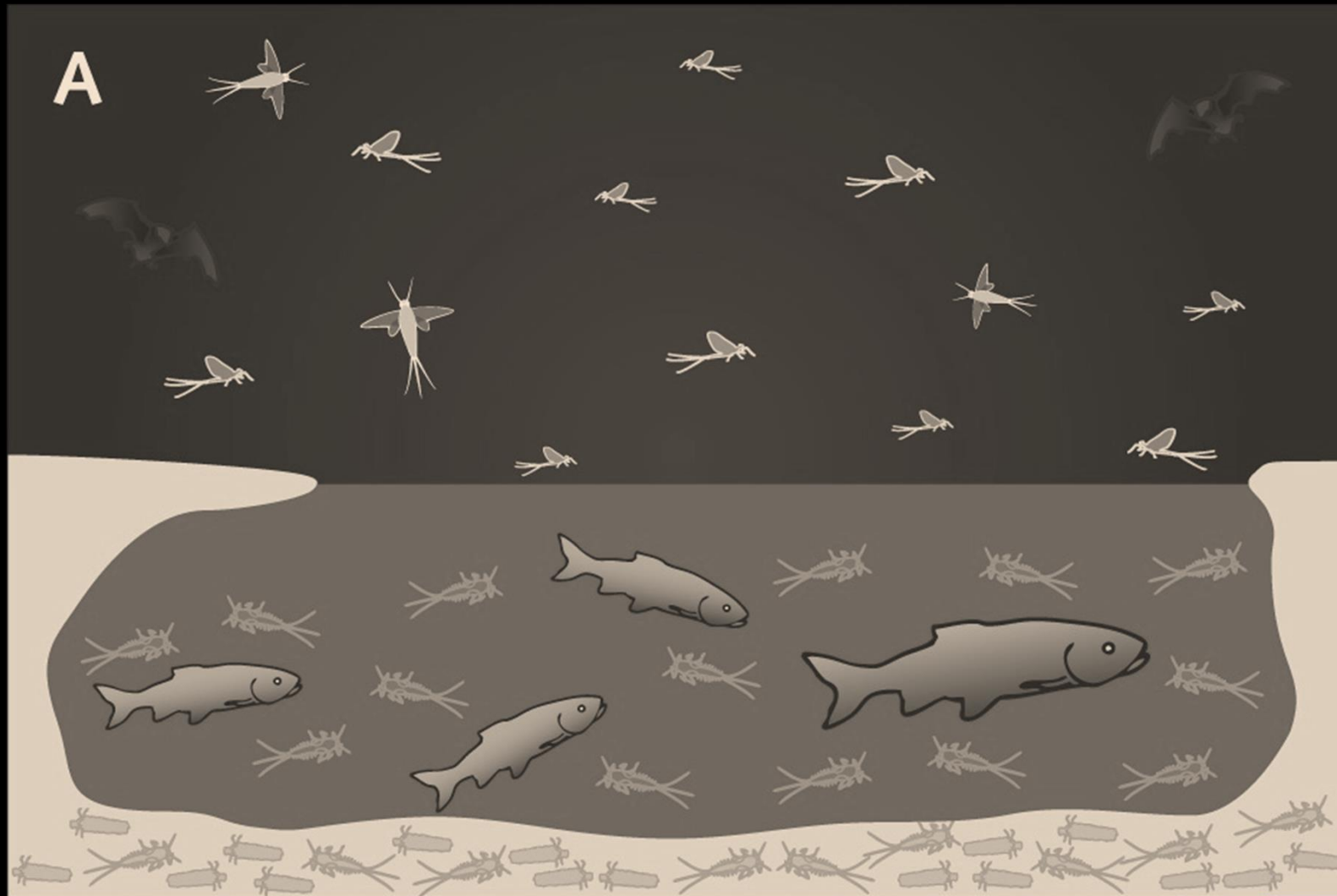
# Who uses the night as living space?

	Estimated number of described species	Thereof nocturnal [%]
<b>Vertebrates</b>		
Mammals	5 488	63,8
bats	1100	100
birds	9 990	19,6
reptiles	8 969	16,6
amphibians	6 433	93,3
Fishes	30 700	14,1
<b>Total</b>	<b>61 580</b>	<b>28,0</b>
<b>Invertebrates</b>		
Insects	950 000	49,4
Lepidoptera	180 000	77,8
Coleoptera	500 000	60
Crustacean	40 000	50
Arachnidae	98 000	5
others	61 209	?
<b>Total</b>	<b>1 232 384</b>	<b>64,4</b>

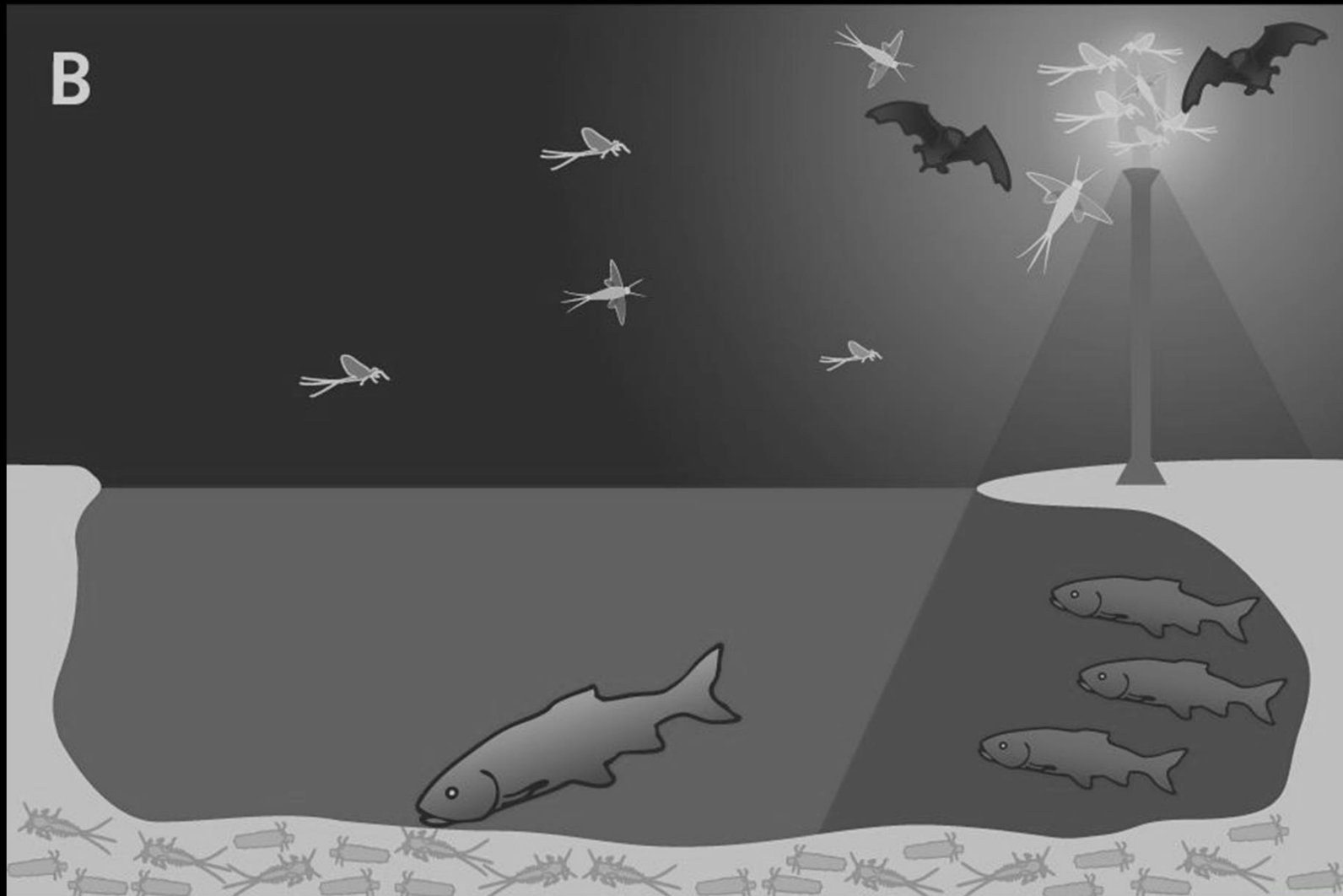
Hölker et al. (2010)  
*Trends Ecol. Evol.* 12,  
 681–682



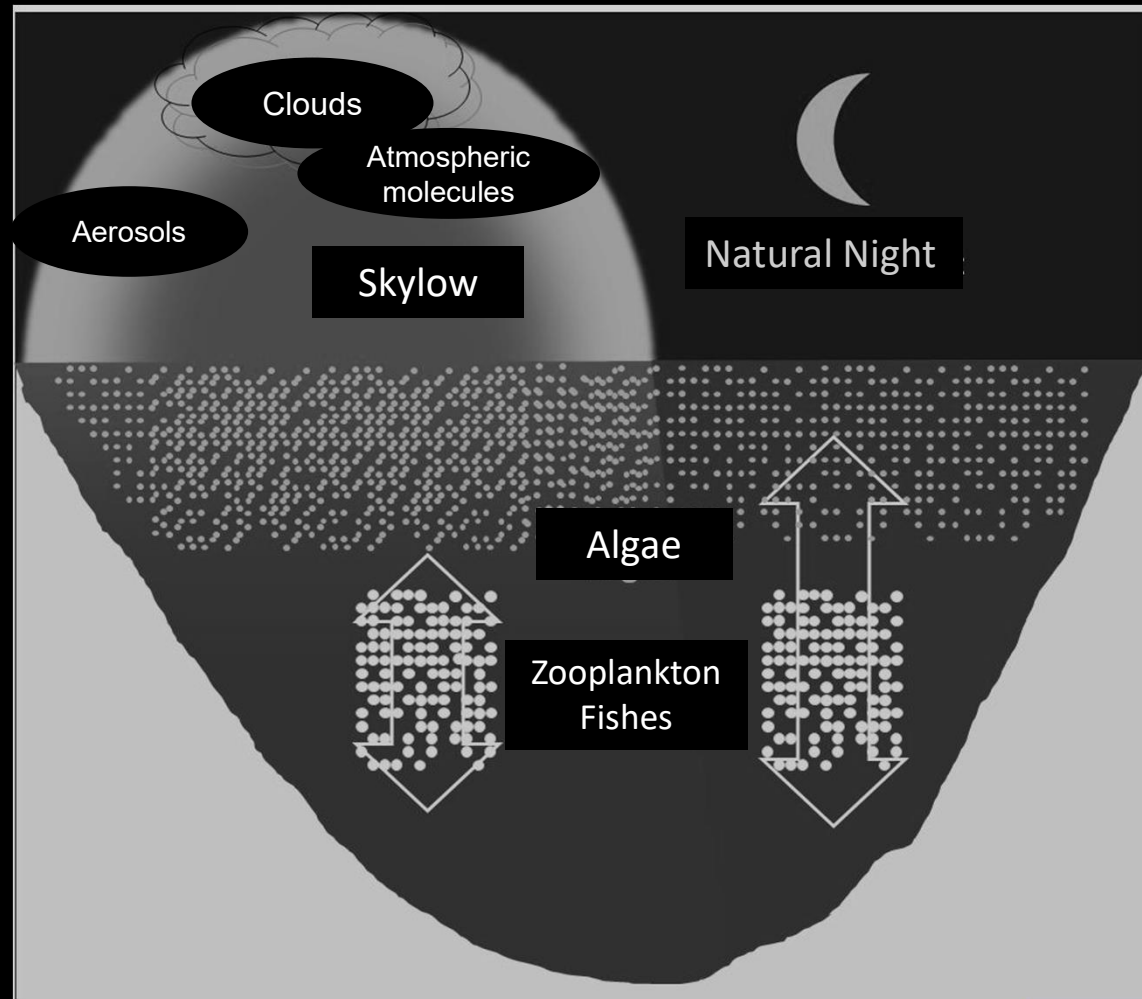
# Riparian ecosystems – a source for life



# Light has an effect

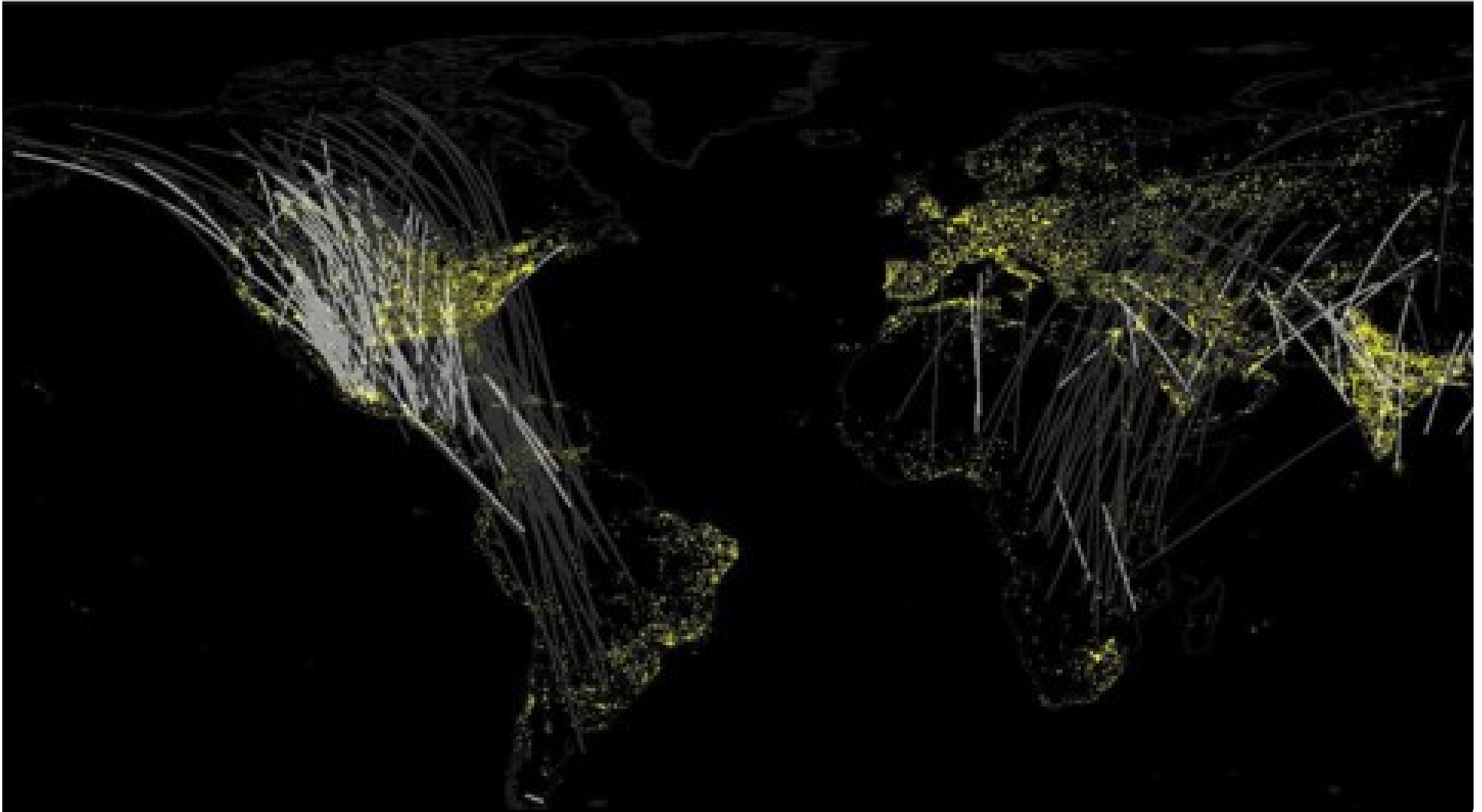


# Vertical migration (zooplankton)



Moore et al. (2000)  
*Int. Ver.Theor. Angew. Limnol.*  
*Verhandl.* 27, 779–782  
Image: Hölker

# Horizontal migration (birds)



Cabrera-Cruz et al. (2018 ) Scientific Reports 8: 3261.



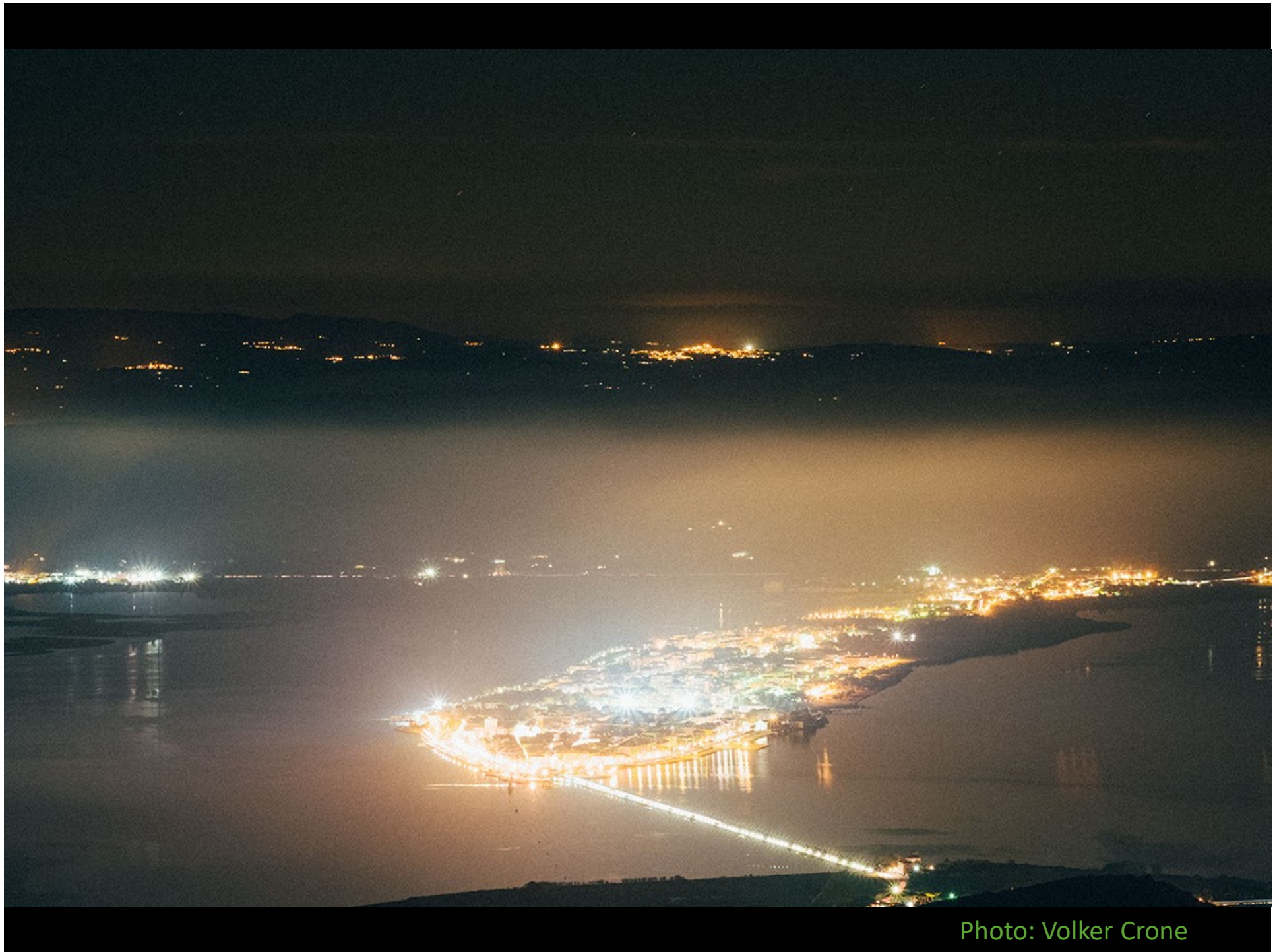


Photo: Volker Crone



# Insect decline

Substantial declines in abundance and distribution

Fox, R. (2013) *Insect Conservation and Diversity*, **6**, 5–19

Two-thirds of the 337 studied species have declined over a 35 years study

Conrad, K.F. et al.(2006) *Biological Conservation*, **132**, 279–291

More than 75 percent decline over 27 years in total flying insect biomass in protected areas

Hallmann et al. (2017) *Plos ONE*, **12**, e0185809

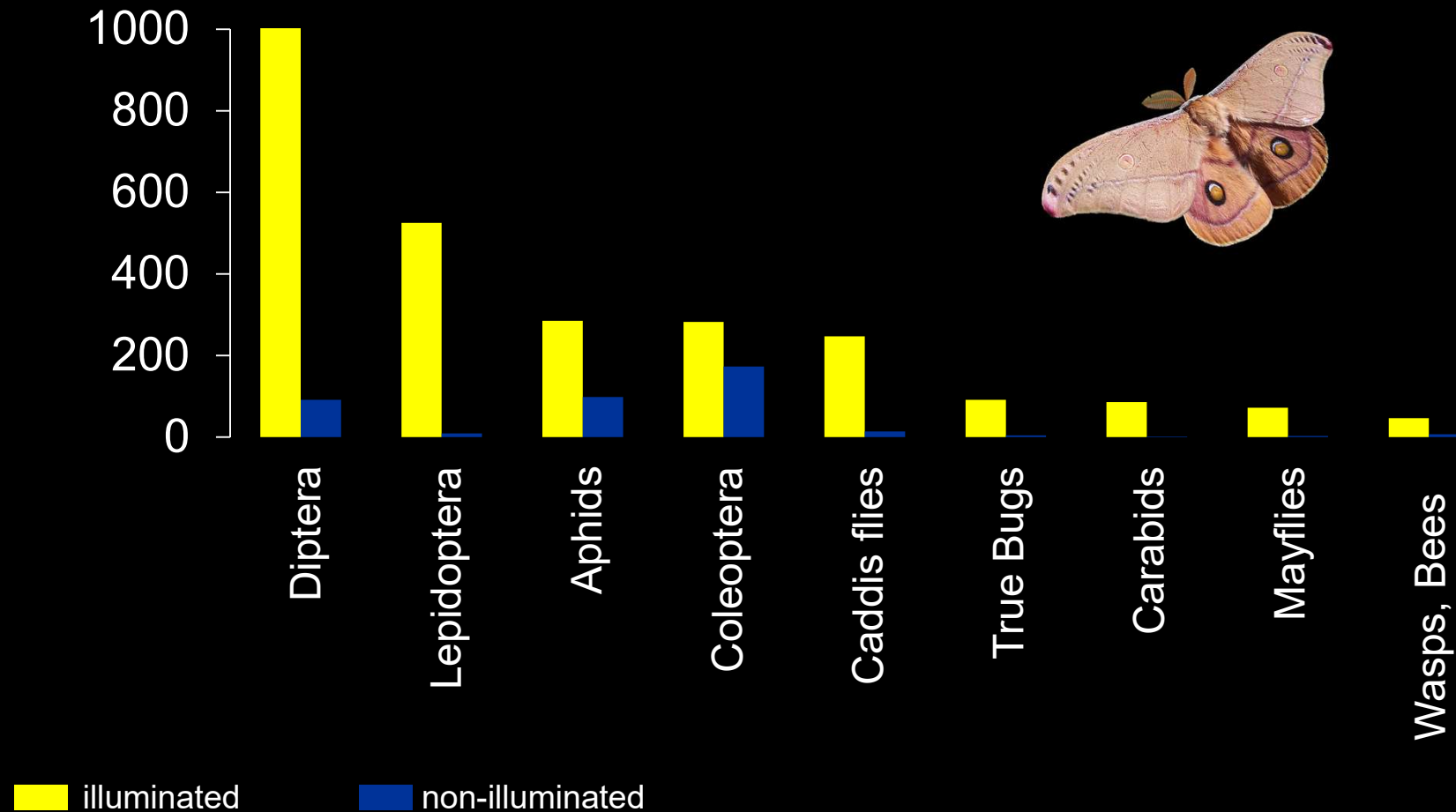
From 2013 to 1989, the total mass of trapped insects declined by nearly 80%

Vogel, G. (2017) *Science*, **356**, 576–579

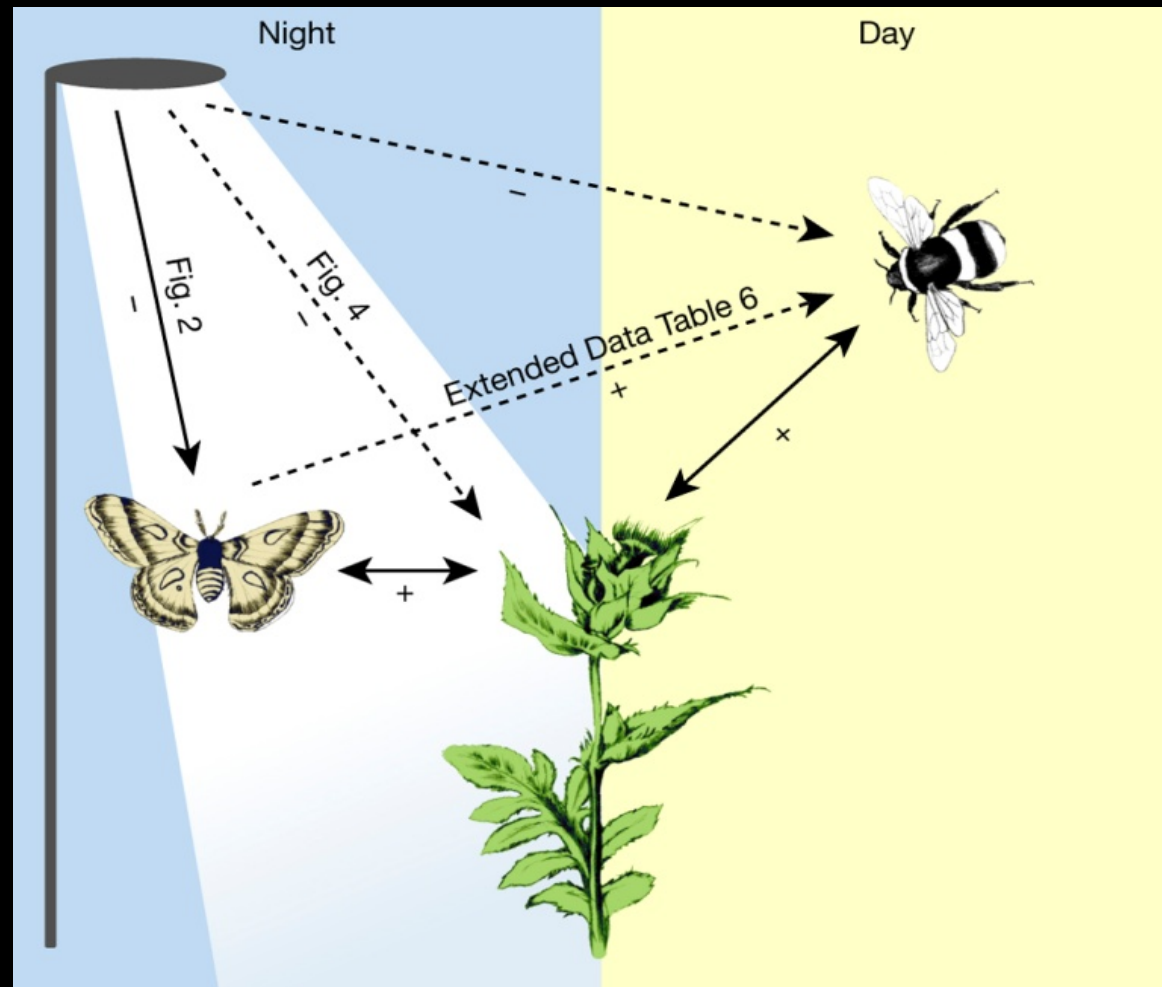
Nocturnal and light sensitive moths have declined the most

van Langevelde et al.(2018). *Global Change Biology*, **24**, 925–932

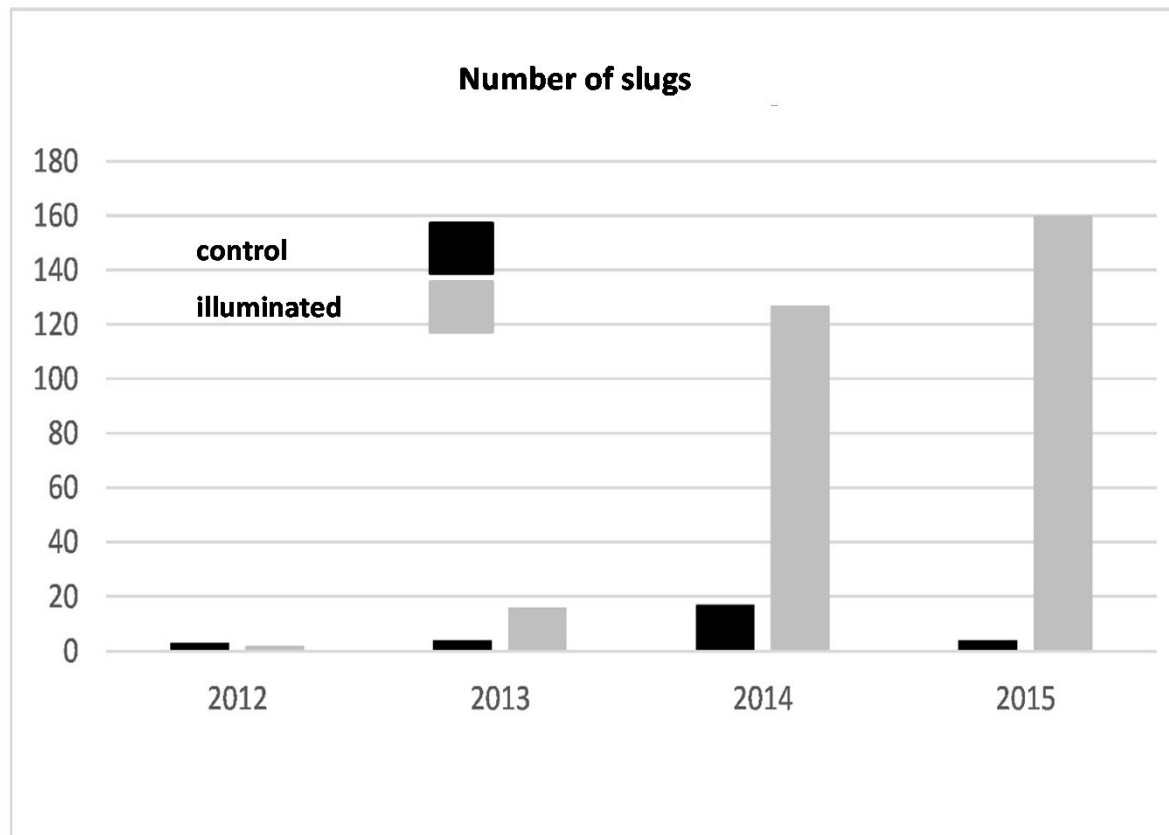
# Insects in average at a single luminaire per year



# Night time pollination affects daytime pollinators



# And the winners are: scavengers!



## Altered occurrence and food consumption

Davies et al. 2012; Manfrin et al. 2018

van Grunsven et al. 2018 (graphic)

Photos: Snails by Termauri, wikimedia commons CC 4.0, Opiliones CC 0.0

**What can be done?**





Illustration: Rainer Stock, Loss of the Night Network 2016

# Guide the light to where it is needed!



Illustration: Rainer Stock, Loss of the Night Network 2016

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Illustration: Rainer Stock, Loss of the Night Network 2016

# Use ambient light colours



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# Use the low light intensity



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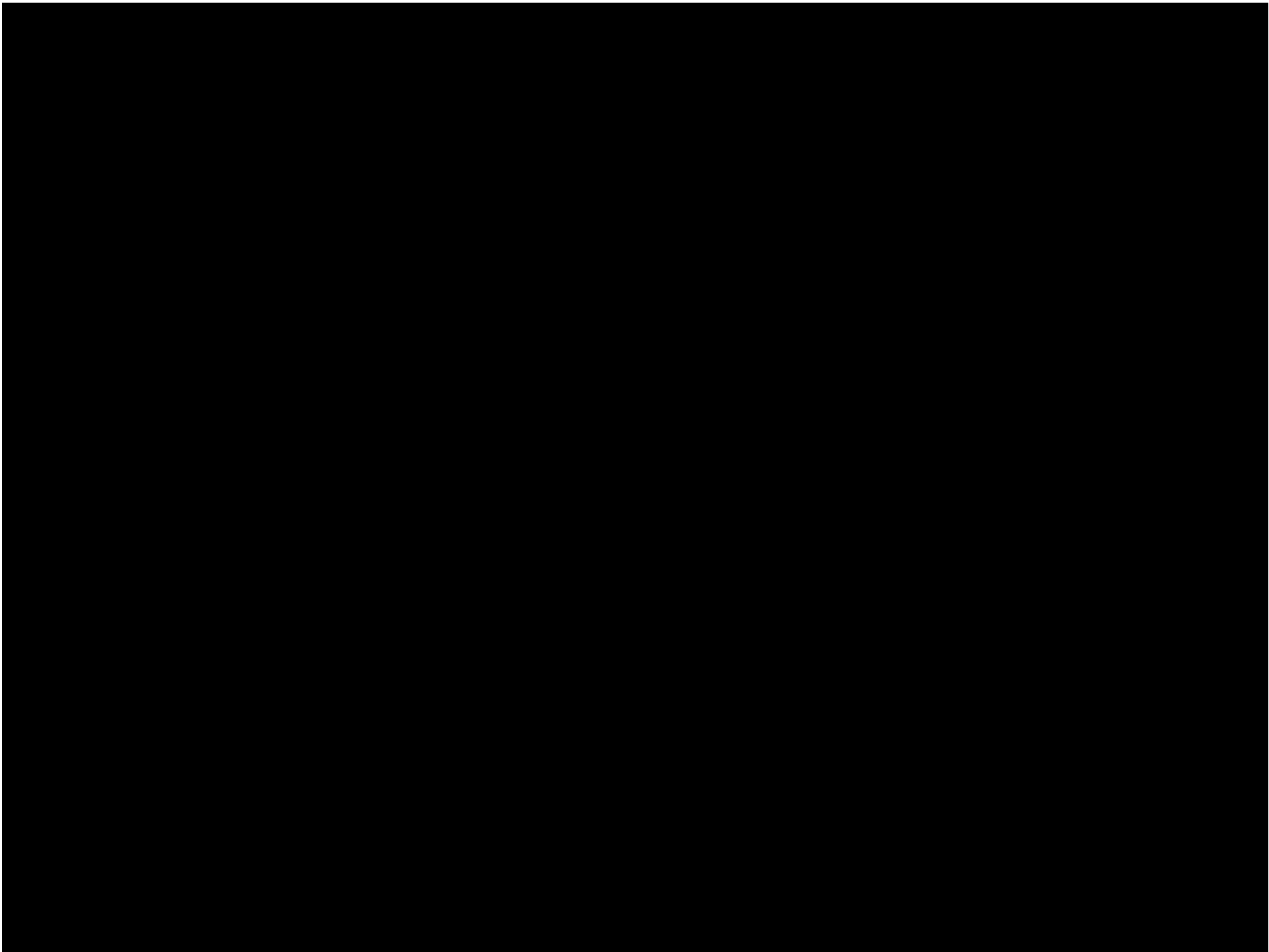


Illustration: Rainer Stock, Loss of the Night Network 2016

**Switch off the light whenever you don't need it**







**Natures best light at night effects**  
- less bright then stars and temporary



Red Tide by Mike: <https://www.flickr.com/people/58761930@N00>

# Light pollution is an environmental problem

- that could be solved in a life time

## Sustainable illumination

- Efficient
- Creates visibility and safety
- Improves aesthetics
- Has low impact on
  - ecology
  - human health or well-being and
  - the starry nightscape

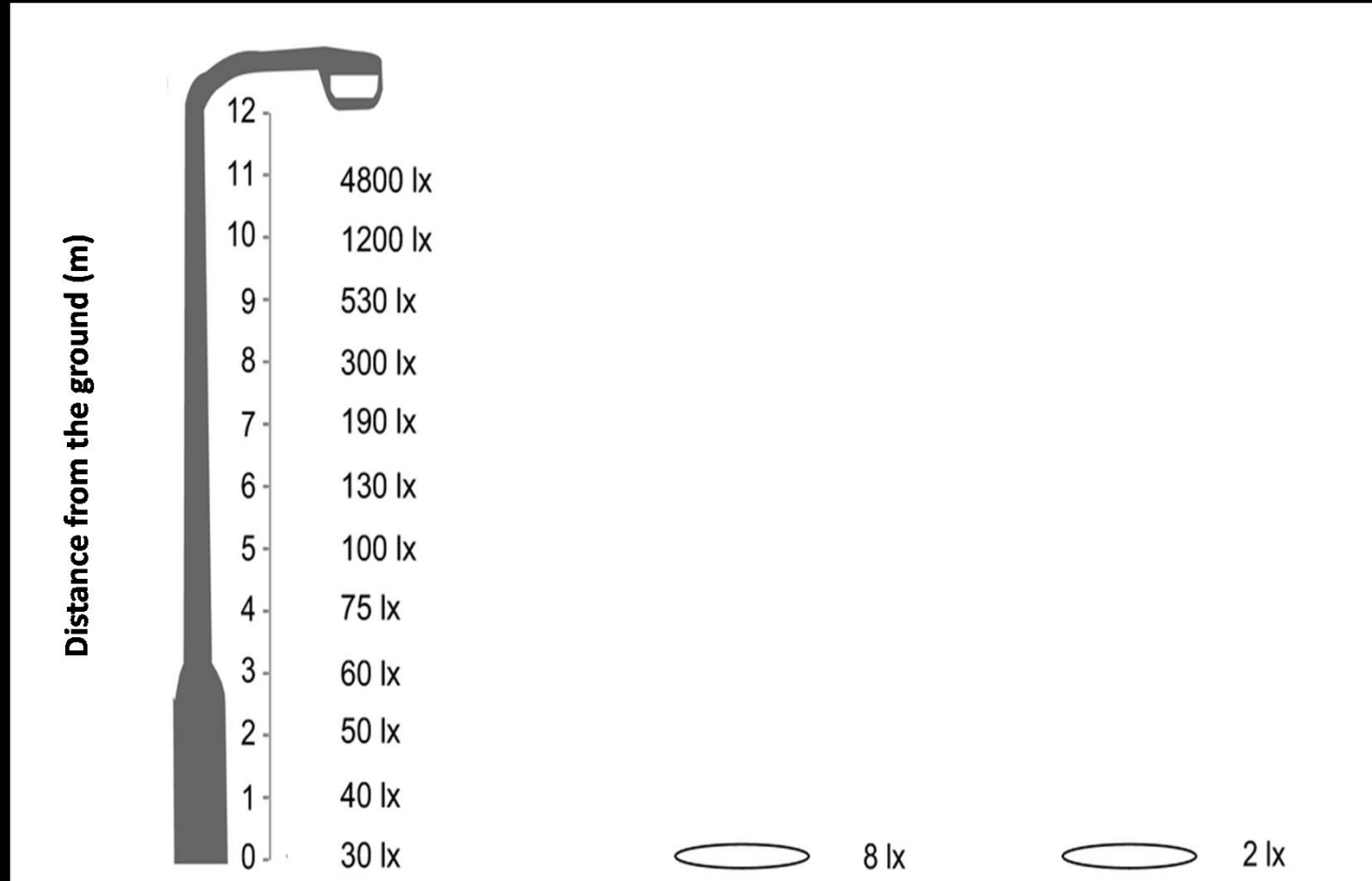
**How important will sustainable lighting become?**

# New draft of the environmental protection law

The German Federal Environment Ministry's Insect Protection Act provides, among other things, for the protection of biotopes that are important for insects actions to reduce light pollution.



# Light intensity of a street light





# Species protection through environmental friendly lighting



## Artenschutz durch umweltverträgliche Beleuchtung

[www.tatort-strassenbeleuchtung.de](http://www.tatort-strassenbeleuchtung.de)



Bundesministerium  
für Umwelt, Naturschutz  
und nukleare Sicherheit



Das Projekt wird gefördert im Bundesprogramm Biologische Vielfalt durch das Bundesamt für Naturschutz mit Mitteln des Bundesministeriums für Umwelt, Naturschutz und nukleare Sicherheit.

# Development of an insect friendly streetlight

2020-2022



2022-2024



**Stakeholders in public lighting**

Illustrated by Catherine Pérez Vega

# Environmentally Conscious Smart Lighting (ECOSLIGHT)

[www.ecoslight.eu](http://www.ecoslight.eu)

- upskilling and enhancing the lighting sector in several topics

**Light Pollution, Human-Centric Lighting, Road Lighting Safety and Security**

- **to respond to the market needs for Environmentally Conscious Smart Lighting Designers.**
- **to develop ECOSLIGHT training programs:** open online courses, e-learning modules, live training sessions and work-based learning adapted to national needs of target countries (France, Italy, Greece, Germany)

supported by the European Framework of Erasmus+ / Sector Skills Alliances Programme

**ECOSLIGHT**

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# Thank you!

